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**RISK CALCULATION TO PROPOSE DISASTER MANAGEMENT FOR SHAFIRA  
CORPORATION'S ENTERPRISE RESOURCE PLANNING SYSTEM**

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*Abstract. Shafco is the pioneer of Muslim fashion industry that has survived for 26 years and became the largest in Indonesia. It is not independent of the technology support in helping Shafco grow and survive. The last four years Shafco choose to develop ERP technologies based on open source. But behind the success Shafco if you see the location of its headquarters located in the eastern Bandung area, there is a risk to threats and disasters since the region was recorded as the Bandung basin area which is prone to cyclones. In this research will try to help Shafco in making disaster management in the descriptive case study format by using the formula environmental risk assessment. Risk analysis results along with the results of observational data and interview, will be used as a benchmark manufacture of disaster management in Shafira. With the same formula will be two approaches to get the value of the risk that in a ratio approach between the receptor and the nominal approach in rupiah. The first is looking for the probability of occurrence of hazards, distinguished for threats from nature that is processed from the data BNPB and to the threat of technological processing of questionnaire data using simple probability calculations. To get the value of the consequences will be different on each approach. Consequences in the comparative approach depend on value for each receptor and to approach the nominal, the consequences of the unit will be expressed in rupiah obtained from the estimated average salary of employees per day multiplied by the number of days of recovery to the threat from human activities and to threats from nature will be used for estimated losses on assets experienced in case of disaster. The current disasters that occurred at Shafira are divided into two categories: natural hazard, in particular whirlwinds (Tornado); and technological including nature-to-technological hazard which flood and blackout (light off) and human-to-technological hazards such mistaken input data and mistaken delete data. The results of calculations using the ratio approach shows that the greatest risk is from the activity of employee negligence, then tornadoes, floods and lastly due to a light off. Meanwhile, when measured using a nominal approach, the risks of large losses are due to floods, tornadoes, off the lights and the last is due to the activity of employee negligence.*

*Keyword: Disaster Management, Enterprise Resource Planning, Hazard, Probability, Environmental Risk assessment*

**Introduction**

In 2010 at least 255 companies in Indonesia are implementing enterprise resource planning system (Muliati, 2010). Shafira Corporation is leading Muslim fashion industry in Indonesia since 1989, which implemented enterprise resource planning system. Since its begun developing and maintain with the system, Shafira Corporation has started to review the preventing factor of enterprise resource planning system due to the occurred of cyclone at its head office (detiknews, 2014). According to result of interview with Manager of Human Resource and General Affair Shafira Corporation Rizki Rahmanto, he said "we need one stop solution for this catastrophe, at least the conceptual model for challenging this situation".

Disaster management is a part of science that learning behavior of disaster and how to preventing or minimizing the risk after disaster (Singh, 2006). The form of disaster management can be defined as standard operational procedure in company. The function of standard operational procedure are to prevent disaster from occurring, respond to a disaster during and immediately after it has occurred, and how to recover from a disaster (Devlin, Emerson, Wrobel, & Desman, 2000). The results are to reduce of losses and recovery procedures from disaster.

The problem is, that disasters are cannot be forecasted accurately, as it can occur at anytime and anywhere Enterprise resource planning has a role to become cases area for researching the business process to determining objective and priorities to create disaster management in the form of standard operational procedures. If the company ignores the importance of disaster management, it would be too risky at the most crucial things and hard to recover, so company will lose many things even the main business stopped.

#### *Background Information*

For this point consist of theory of enterprise resource planning and disaster management combined with detailed background information. More describing information about company profile with current condition of enterprise resource planning and disaster management at Shafco will state on this point.

#### *Company Profile*

Shafira Corporation is Main Corporation for PT Shafira Laras Persada and PT Shafco Multi Trading. It established since 1989 in Salman ITB by Fenny Mustafa. She is an activist Salman ITB who cares about Muslim wardrobe, which is looking rigid and too ordinary. She wants to change that Muslim fashion to be more accepted by people and then after 26 years, Shafira Corporation becoming the leading industry in Indonesia with several brand. As the one big company at retail, Shafira Corporation supported by more than 126 store outlet around Indonesia consists of store, mini department store, and franchising. In the inside, Shafira Corporation supported by automatic cutting machinery, high technology in sewing machine, computer patterned machine, and enterprise resource planning system. Shafira Corporation (Shafco) invested on the enterprise resource planning from Italy at 2006 that covered all of business process in company. With the dynamic of company, Shafco has built its own enterprise resource planning that covered new development of business line, offering flexibility, real time report, and mobile based system that can be using at anywhere and anytime.

#### *Enterprise Resource Planning*

Enterprise resource planning or is a group application that existed on each department of a company that interconnected to business process (Madu & Kuei, 2005). Enterprise resource planning is an information system data that has the ability to plan such as a forecasting, it is not like the ordinary information system which is only a recorded data. Shafco enterprise resource planning consists of Human resource, Point of Sales, Inventory, Finance and Controlling, Material Management, and Production Planning. It is representative from supply chain management at Shafira Corporation and covered all business process on company (Setijono, 2010).

In this study, the enterprise resource planning became the object as a representative of the business processes of a company. Supply chain management or SCM is procedure-enabling conditions for integrity, integration, process optimization, operational efficiency, continuous improvement and sustainable competitive capabilities in a network of production-distribution (Madu & Kuei, 2005). SCM is a representative of the business processes within the scope of operations. SCM is used as a benchmark for weighting hazard crucially important that the critical point can be found.

### Disaster Management

Disaster management is a multidisciplinary area, covering a wide range of issues such as monitoring, forecasting, evacuation, search and rescue, relief, reconstruction and rehabilitation (Singh, 2006). Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation (UNISDR, 2009).

Therefore, Rina Tnunay describes Disaster management as procedure or discipline conducted and managed through a systematic process for dealing with disasters and lessen the impacts of disaster as well as how to be able to continue life after the disaster. Disaster management consists of mitigation, prevention, risk reduction, preparedness, response and recovery (Tnunay, What is disaster management?, 2013). In the world there is nothing immune from disaster, according to book with title Response to the Disaster, researcher divide disaster agents into two categories: Technological and Natural Hazard. (Henry W. Fischer, 1998) In that book, Henry wrote that Technological agents are often said to cause "(Hu)-man-made. Technological Hazard also triggered directly as a result of the impacts of a natural hazard event. (UNISDR, 2009).

Table 2.1 Previous Research

No	Title	Year	Author	Explained		
				Nature	Human	Both
1.	Terminology on Disaster Risk Reduction (Part Technological Hazard)	2007	UNISDR			✓
2.	Are Natural Disaster Really Natural?	2015	Rescue Global	✓		
3.	What is Disaster?	2013	Rina Tnunay			✓
4.	Response to Disaster		(Henry W. Fischer, 1998)			✓
5.	What is a Disaster?		E.L Quarantelli	✓		

Natural hazard events can be characterized by their magnitude or intensity, speed of onset, duration, and area of extent. For example, earthquakes have short durations and usually affect a relatively small region, whereas droughts are slow to develop and fade away and often affect large regions. In some cases hazards may be coupled, as in the flood caused by a hurricane or the tsunami that is created by an earthquake (UNISDR, 2009). Natural Disaster divided into weather-related such as floods, landslides/mudslides, windstorms, tornadoes, thunderstorms, winter storms, droughts, forest fires, etc

and geophysical-related such as earthquakes, volcanic eruptions, tsunamis, tidal waves (Tnunay, What is Disaster?, 2013).

The United Nations Office for Disaster Reduction defined Technological Hazard as

*"originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage".*

Industrial pollution, nuclear radiation, toxic wastes, dam failures, transport accidents, factory explosions, fires, and chemical spills are includes into examples of Technological Hazard mentioned by UNISDR. Man-made Disaster or it will be defined as technological hazard in this research, consist of non-intentional likes transportation accidents (road/sea/air), fires, building/bridge collapse, etc and intentional such as race/ethnic conflict, terrorism, civil war, etc (Tnunay, What is Disaster?, 2013). Researcher uses one formula that is environmental risk assessment for both approaches ratio and nominal approach that use in this research. It will be impact for two factors in calculation risk, there are probability and consequences. So to calculate the probability and the consequences from each approach will be different. Basically the formula to calculate the risk of hazard will use formula environmental risk assessment from Royal Society of Chemistry.


$$\text{RISK} = \text{Probability} \times \text{Consequences}$$


Figure 2.4 Formula of Environmental Risk Assessments

Purpose of table 2.2 is describing as a whole risk calculation in this research in the hope that the reader can understand the results of the study with a clear explanation of the tools that use to do analysis.

Table **Error! No text of specified style in document..1** Describing Risk Calculation

Approach/ Formula	Probability		Consequences	
	Natural Hazard	Technological Hazard	Natural Hazard	Technological Hazard
Ratio	Total event of natural hazard divided by period time.	1. Data source: - Questionnaire for Mistaken input and delete data Total event of technological hazard divided total sample.	Weight of receptor multiplying by probability of natural hazard	Weight of receptor multiplying by probability of technological hazard
Nominal		- Questionnaire for Light Off Average event in a month 2. Data source: BNPB for Flooding Total event divided by period time	Loss asset	Loss of salary mean per day multiplying by recovery day (Mistaken Input and delete data  Loss asset (Flooding and light off)

### *Sequence of Events and Data*

For this point will be describe steps of methodology design. There are relevant data to make an analysis and presented in tables and graphs.

- *Methodology*

The purpose of this study is to know about disaster management especially for enterprise resources planning system at Shafco. On this point will be described the research methodology of this study and describe the step used in designing the instrument and collecting the data. First step is preparation, analysis design, implementation, collecting data and the last is preparation of report and analysis.

- *Analyzing ERP*

Shafco has an ERP which contains many modules such as R&D, Purchasing, Point Of Sales, Finance, Logistic and HRIS. Basically the ERP contain about request form and approval, reporting, and bank data. Shafco ERP based on opensource that developed 4 years ago by MIS department and the interface of ERP are totally confidential. The SCM will be described the rest value of ERP that will be determined critical point in Shafco. The mandatory entity at SCM will be becomes scope of the ERP Shafco is manufacture process.

- *Analyzing Hazard*

The current disasters that occurred at Shafira are divided into two categories: natural hazard, in particular whirlwinds (Tornado); and technological including nature-to-technological hazard which flood and blackout (light off) and human-to-technological hazards such mistaken input data and mistaken delete data.

- *Analyzing SOP*

Shafira Corporation not have a standard operational procedure for disaster management either preventive or in action, but it does not mean there is no activity that is included in disaster management. From the data obtained either by observation or questionnaires, Shafira Corporation has had an action are included in disaster management such as for example in the event of a tornado December last year in improvement makes disaster recovery team to coordinate post-disaster repairs.

In addition, according to Mr. Dedi -the representative of the MIS division said that Mr. Edi -the general manager had ordered him to back up the data into the cloud system, although Mr. Edi does not know exactly how important the data is uploaded. These activities are carried out every day even if no data is considered very important to be made of backing up data to the cloud as a preventive measure up to three times a day.

- *Feedback Shafira*

The result obtained of penetrating concept to related department is they are enthusiastic about this research. Shafira Corporation tends to be aware of the importance of preventive measures before the occurrence dangerous and unpredictable situations. According to Mr. Doemadio Adi as general manager supply chain at Shafira Corporation that prevent is better than cure. Mr. Adi likens SOP for action to overcome if there is any disaster as the result of this research will have no effect if the system is not in use or implemented.

### *Discussion*

This point discusses the analysis of problems described in the previous chapter. Result and step of calculation the risk formula will be presented in this point. Calculation divided into ratio approach and nominal approach.

#### *Determining Probability Hazard*

Calculate the probability hazard will be divided into two type based on factor that affect the disaster by nature or human. From the last 10 years, Bandung was attacked eight times the tornado. The peak occurred in late 2014 with a record 500 people were displaced and Bandung also attacked five times flooding documented by BNPB for last 10 years.

Table 4.1 Probability from BNPB

Source	Events per 10 year	Probability
Tornado	8	8/10 = 0.8
Flooding	5	5/10 = 0.5

Determined of probability hazard nature is define how much the hazard occurred in 10 years. The data is result from Badan Nasional Penanggulangan Bencana (BNPB) for regional in Bandung that had been possibility occurred and disrupts Shafira Corporation. Determined of probability hazard by human is define how much the hazard occurred in each pathway accumulated as bundle of sample.

Table 4.2 Probability Hazard from Questionnaire

Source	Event per representation	Probability
Mistaken Input Data	35	35/42 = 0.83
Mistaken Delete Data	14	14/42 = 0.33
Light Off	2	2/30 = 0.07*

The data is recapitulation of the answer from representation for each pathway who got measurement question that they are have been or not do mistaken input data and delete important data. For light off even though the same probability obtained from the questionnaire, but the way the calculation is different. Of the average questionnaire response that occur lights off in Shafira is 2 times a month, so the probability is 0.07 obtained from events divided into 30 days (estimation 1 month = 30 days).

#### *Calculating Risk by Ratio Approach*

Results for this approach is present a value ratio of risk for each hazard, consequences is differentiated only by probability of hazard. Royal society chemistry said that in more complex cases, it may be appropriate to use quantitative risk assessment approaches. Such approach can define the pathway and consequences using modeling/estimation techniques that allow the level of exposure of a receptor, and the consequences to the receptor, to be better determined. In some cases probabilistic models can be used to estimate the actual probability of risk occurring.. Consequences are the degree of impact that can be affected or how much losses rates or times to recovery from a disaster.

Table 4.3 Result Risk by Nature for Each Pathway/Source

Pathway/Source	Tornado		
	Probability	Consequences	Risk
HO	0.80	0.32	0.26
PG	0.80	0.26	0.21
BA	0.80	0.21	0.17

While on that table can be seen, the pathway which has the most risk by tornado sequentially there are, Head Office, Pangaritan and Bintang Agung warehouse. The ranges of risks between 3 pathways are not far.

Table Error! No text of specified style in document. 4 Result Risk by Technological Hazard

Pathway	Mistaken Input Data	Mistaken Delete Data	Flooding	Light Off	Total Risk
PG	0.23	0.036	0.08	0.0016	0.35
HO	0.28	0.044	0.10	0.0020	0.43
BA	0.18	0.028	0.06	0.0013	0.27

Calculation of the risks caused by technological hazard the most highest same with nature that Head Office is first pathway that more risky.

#### Calculating Risk by Nominal Approach

Result risk by natural hazard

Source	Probability	Consequences	Risk
Tornado	0.8	Rp. 22,000,000,000,-	Rp 17,600,000,000,-

Using formula see table 2.2 the result shown risk of tornado is around Rp 17,600,000,000. Result risk by technological hazard:

Table **Error! No text of specified style in document..2** Calculating Risk Nominal Approach for Technological Hazard

Source	Probability	Consequences			Risk
		Loss Asset	Recovery Day	Loss of salary mean per day (sample)	
Mistaken Input Data	0.83	-	1	Rp 4,851,000	Rp 4,026,330
Mistaken Delete Data	0.33	-	0.4	Rp 4,851,000	Rp 640,332
Flooding	0.5	Rp 300,000,000,000	-	-	Rp 150,000,000,000
Light Off	0.7	Rp 800,000,000	-	-	Rp 560,000,000

Result shown that risk as nominal is by flooding but need to remember that the probability is for 10 years. Next risk is by light off that if Shafco doesn't prepare of this hazard will be lose on that nominal risk. Nominal for mistaken input data and delete data is the lowest risk in nominal.

#### Conclusion

In Shafco SCM, manufacturing is already covered in the firm's ERP system, however it still need further stakeholder attention. The current disasters that occurred at Shafira are divided into two category: natural hazard, in particular whirlwinds; and technological (including nature-to-technological and human-to-technological) hazards, which are for instance (by ratio approach) flooding, data input errors, blackouts, and data delete mistakes. If sorted by the risk by nominal approach, from the highest risk to the lowest, then at the most risk is flooding, whirlwind, blackout, data input errors and the last is data delete mistakes.

Result from calculating risk for each pathway found that the critical point is the Head Office; and if compared with the results of employee questionnaires, that put critical point in the head office, more precisely in sales and marketing. The department dependency at Shafco shown that the most responsible department by product sales results that is marketing and sales. After that, the second most-important is TAF department, then production department. The current condition of disaster management at Shafco are almost ready to create SOP in Head Office for disturbing hazard on the data ERP, and also Pangaritan for saving more the products physically. The feedback gained after the

proposed concept is, that Shafco prefers disaster management as preventive measures, such as plan A to Z contingency preparations.

Lesson learned obtained from creating case on descriptive about Disaster Management for ERP at Shafco is the importance of preventive measures before the occurrence dangerous and unpredictable situations. But need to remember, But need to remember that even though this is already extensive business remains limited resource for new things. Thus it is necessary to ensure parts need to be or not to take action on investing more in making disaster management. Last but not least disaster management as well as any design would be useless if not implemented in real life.

#### Recommendation

After doing risk calculation with two approaches and getting some fact/data from result by interview and questionnaire, the researcher give some recommendation for Shafco, that has aware for disaster management and already do some stage in disaster management if seen using stages of disaster management according to Rina Tnunay (Tnunay, What is disaster management?, 2013). If the condition describes:

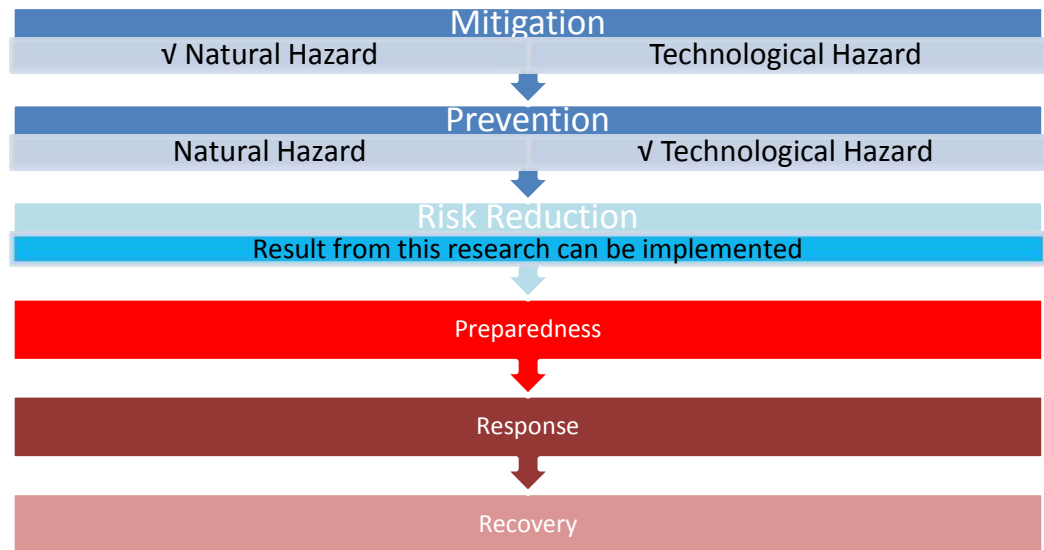


Figure Error! No text of specified style in document..1 Curently condition Disaster Managemnt at Shafco

Disaster management from technological hazard:

1. Create SOP to overcome the hazard on the data ERP especially in Gede Bage Head Office where are marketing and sales also TAF department located, which are need more attention.
2. Shafco facilitated the user back-up for each employee that need more care about their data such as employee at sales and marketing department and also especially at TAF department.
3. Shafco must be prepared to invest more in providing greater servers.
4. Shafco create sharing folder system as part of preventive action for a whole.

Disaster management from natural hazard:

Conduct training or disaster simulation routine in all areas of Shafco, in advance to secure their valuable asset that exists and is the responsibility of each Pathway. Head Office as the most risk Pathway that need to do training to make a back-up data on a regular basis so hopefully when the disaster come, data preservation can be done in time thanks to preparedness. So is Pangaritan which has the key of manufacturing process and also Bintang Agung warehouse that ever affected by whirlwind last year



which has responsible more for the physical assets of products which are either for raw material, semi-finished and finished good.

*Recommendation for future research:*

Suggestions for future research in Shafco is about how to propose Disaster Management using risk-management approach, so that it can find a way to manage risk and to know the preparedness measures with the calculated probability that is more accurate.

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